HERRING RESOURCES AND MANAGEMENT IN SOUTHEAST ALASKA:

ANSWERS TO SOME RECENT QUESTIONS.

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WHAT HARVEST STRATEGY IS USED FOR HERRING FISHERIES IN SOUTHEAST ALASKA ?

The allowable herring harvest is based on a graduated scale that allows for higher harvest rates as a herring population increases relative to its threshold spawning level. Fishing is not allowed unless a minimum threshold level of mature herring is available for spawning. This approach maintains annual harvest rates between 10-20% of the spawning stock in excess of established threshold spawning levels. The allowable harvest rate never exceeds 20%, regardless of the amount of spawning biomass. When the spawning stock is at its minimum threshold level, a 10% harvest is allowed. The percent harvest rate is estimated as:

$$\text{Percent Harvest Rate} = 8 + [(2) \times \frac{\text{Spawning Population Size}}{\text{Threshold Level}}]$$

WHAT SCIENTIFIC EVIDENCE INDICATES THAT A MAXIMUM 20% HARVEST RATE IS SAFE AND CONSERVATIVE, AND WILL PREVENT OVERHARVEST ?

A study by Jie Zheng, Fritz Funk and Gordon Kruse of the Alaska Department of Fish and Game, and Robert Fagen of the University of Alaska, and presented in a recent scientific forum (International Symposium on Management Strategies for Exploited Fish Populations October 14-16, 1992) suggests that a 20% harvest strategy is sufficiently conservative to maintain healthy stocks of herring. A study by Doubleday ("Managing herring fisheries under uncertainty" 1985 Canadian Journal of Fisheries and Aquatic Sciences 42:245-257), also supports the use of a 20% maximum harvest rate. British Columbia herring fisheries are also currently managed using a 20% annual harvest rate.

WHAT IS "OVERHARVEST" ?

As normally used in fisheries management, the term "overharvest" implies harvest that results in substantial and long-term reduction in the abundance of a stock of fish. While annual catches in southeast herring fisheries periodically exceed a target quota for a particular year, this has rarely resulted in substantial, long-term reduction of the abundance of a stock of herring. Southeast herring target quotas are exceeded, normally by very minor amounts, because it is impossible to keep a completely accurate, up-to-the-minute tally of the catch as a fishery is being conducted. This is generally true for any fishery whether it is a sport salmon fishery or a commercial herring fishery. Despite periodic catches that exceed a target quota at Kah Shakes, the maximum 20% harvest has been attained only twice in the last 17 years. During most of the last 17 years, the actual harvest rate has been less than 15%.

HOW DOES THE STATE'S HARVEST STRATEGY PREVENT OVERHARVEST OF SOUTHEAST HERRING STOCKS OR INCREASE THE SIZE OF A STOCK IF IT HAS BEEN DEPLETED ?

ADF&G uses the conservative threshold harvest strategy described above to prevent overharvest of southeast herring stocks. The maximum target harvest rate is never allowed to exceed 20%, regardless of how high the abundance of a stock is. When a stock is below the threshold level set for that stock, no fishing is allowed. For example, there was no fishery at Kah Shakes in 1990 because the estimated spawning biomass was below the 5,000 ton threshold established for Kah Shakes. For the following year, the estimated spawning biomass had increased and was greater than the 5,000 ton threshold, so a fishery was conducted at Kah Shakes in 1991. Similarly, there were no herring fisheries at Seymour Canal in 1991 or 1992, nor at Lynn Canal since 1982, because the stocks in these areas have been below the established threshold levels.

WHY WOULD A SOUTHEAST HERRING STOCK DECREASE BELOW THE ESTABLISHED THRESHOLD LEVEL IF THE STATE USES A CONSERVATIVE HARVEST STRATEGY DESIGNED TO PREVENT OVERHARVEST ?

Worldwide, herring populations are commonly recognized as being very cyclic in abundance, with no strong relationship between spawners and recruits. A recent example would be the Sitka stock where excellent survival conditions allowed that stock to attain the current high levels from one of the lowest escapements ever, in 1976. The Sitka spawning stock has remained at high levels since, with a high historic escapement occurring in 1988 and a second high historic escapement estimate occurring in 1992.

WHY WAS THE KAH SHAKES HERRING FISHERY EXPANDED TO INCLUDE THE AREA AROUND CAT AND DUKE ISLANDS IN 1991 ?

The area for the fishery was expanded because it appeared that the majority of the fish had moved from historic spawning grounds around Kah Shakes to the area around Cat and Duke Islands. ADF&G regularly uses hydroacoustic instruments and methods to monitor the location and relative size of spawning biomass of herring at staging areas prior to herring spawning. In 1991, the department had been hydroacoustically monitoring large schools of pre-spawning herring in the normal staging area near Kah Shakes. Over the period of a few days, these schools largely disappeared from the Kah Shakes area. At the same time large schools of pre-spawning herring appeared in the vicinity of Cat and Duke Islands, indicated first by large concentrations of sea lions and birds feeding on the herring and substantiated by hydroacoustic monitoring. This probable shifting of most of the spawning biomass from the vicinity of Kah Shakes to the area around Cat and Duke Islands led the department to expand, by Emergency Order, the Kah Shakes fishery to include state waters around Cat and Duke Islands. In October of 1991, the Board of Fisheries examined the available evidence in a public forum and formally expanded the Kah Shakes sac roe area to include the area around Cat and Duke Islands.

The department has recently reviewed the status of the herring stock that spawns in Kah Shakes, Cat Island and Annette Island and concluded that the herring spawning at Cat Island in 1991 and 1992 were probably made up of stocks that previously spawned at both Annette and Kah Shakes. As an additional conservative measure, when the fishing boundaries were expanded to include Cat Island, the threshold necessary to allow a fishery was increased from 5,000 to 6,000 tons.

WHAT METHODS ARE USED TO ESTIMATE THE ABUNDANCE OF SOUTHEAST HERRING STOCKS ?

The primary method used to estimate abundance of herring in southeast is the spawn deposition survey. The spawn deposition surveys utilize direct observation of herring eggs by SCUBA divers, using a two-stage statistical sampling design, to provide estimates of the number of eggs deposited by spawning herring in a particular area. These numbers are used with estimates of the average numbers of eggs produced by individual female herring to estimate the spawning biomass. This same method is used by British Columbia as part of their herring stock assessments. In addition, an improved biomass estimation technique that uses information such as herring age composition, size-at-age and fecundity-at-age, in addition to spawn deposition, will be used to estimate herring spawning biomass for 1993.

MIGHT THE REBOUNDING OF HERRING STOCKS SINCE THE DAYS OF THE REDUCTION FISHERIES BE ATTRIBUTED TO DECLINES IN PREDATORS SUCH AS STELLER'S SEA LIONS AND HARBOR SEALS ?

The abundance of Steller sea lions and harbor seals has declined over much of the Gulf of Alaska. Southeast Alaska is the exception to that trend and there is no evidence these marine mammal populations in southeast Alaska are nutritionally stressed. According to John Lewis, marine mammal biologist with ADF&G, Steller sea lions have declined 75 percent in the western Gulf of Alaska while at the same time the number of sea lions in Southeast Alaska has remained at high levels and may be increasing due to the addition of new rookeries and good pup survivals. Harbor seals have declined 60 to 90 percent from Prince William Sound to Unimak Pass but the numbers of harbor seals in Southeast has also remained at high levels. According to Marilyn Dahlhein, a marine mammal biologist with the National Marine Fisheries Service, Pacific white sided dolphins are becoming much more prevalent in the internal waters of Southeast Alaska. Small schooling fishes such as herring are important food items to these animals and during the past three years these dolphins have become quite common in areas of herring concentrations. In addition, during the past year the estimated abundance of humpback whales, a major predator of herring, was the highest it's been in recent years. The stable or increasing abundance of these marine mammals species that feed heavily on herring, tends to support estimates of substantial herring populations throughout southeast Alaska.

MIGHT THE RECENT DEATHS OF SOME GREAT BLUE HERONS IN THE KETCHIKAN AREA BE LINKED TO HERRING ABUNDANCE ?

According to Phil Schempf, a biologist with the U.S. Fish and Wildlife Service, there is nothing in the literature concerning the food habits of great blue herons that would indicate that herring are an important food item for great blue herons. These birds are nonselective feeders whose preferred shallow water habitat and method of feeding (by wading in shallow water rather than diving) limit their opportunities to feed on herring except during the fish's spawning activity. The late winter is a difficult time for many birds and may develop a weakened condition due to extended periods of cold weather. It is common for many types of birds, including eagles, to be in their poorest condition and have their greatest mortality during this time of year. (Phil Schempf, USF&WS Ornithologist, personal communication). Mike Jacobsen, also a biologist with the U.S. Fish and Wildlife Service, has indicated that populations of bald eagles have been steadily increasing in southeast Alaska.

MIGHT THE REPORTED SMALLER SIZE OF HERRING IN THE SITKA AREA BE A SIGN OF DECLINING OR UNHEALTHY POPULATIIONS ?

A recent tendency toward smaller size at age of Sitka herring may actually result from their greater abundance and therefore increased competition for food. This potential density dependence for Sitka herring has been suggested by Dr. Jeremy Collie, formerly of the University of Alaska (Collie, J. 1991. Herring population dynamics and management in Sitka Sound, Alaska. in Proceedings of the International Herring Symposium. Alaska Sea Grant AK-SG-91-01).

MIGHT SOUTHEAST ALASKA HERRING STOCKS BE IN DANGER OF THE TYPE OF OVERHARVEST AND COLLAPSE EXPERIENCED BY NORWEGIAN HERRING STOCKS ?

The collapse of the Norwegian spring spawning herring stocks and fishery is attributed largely to excessive commercial harvest. Beginning in about 1961, the annual harvest rate on the Norwegian herring increased dramatically from about 20% to over 75% in the very short span of six years. In contrast, by maintaining a maximum harvest rate of 20% for southeast herring stocks, the chance of overharvest like that experienced in the Norwegian spring spawning herring is minimized substantially. Further conservatism is built into the state's management strategy by including a sliding harvest rate schedule which provides for harvest rates less than 20%, depending on the available biomass, and a threshold below which no fishing is allowed.

IF SOUTHEAST HERRING STOCKS ARE AT SUCH HIGH LEVELS, WHY DID LOCAL COLD STORAGES BUY BAIT FROM THE EAST COAST LAST YEAR ?

Local processors have bought bait from the western Atlantic during this past year because of their ability to purchase herring of a specific size at a reasonable cost. Changing market conditions have greatly reduced the demand for bait herring with the exception of uniformly large herring. The proportion of younger, smaller fish in the winter bait fishing populations in Southeast Alaska has made our local stocks largely unsuitable to satisfy this demand. During the 1992/93 season, the total catch may only account for about half of the fishery quota due to a continuation of this market trend. Squid is becoming the bait of choice for the black cod and true cod longline fisheries with a continued interest in larger herring for the halibut and crab fisheries. In addition, Southeast Alaska is no longer the only supplier of bait for the state. Areas such as Prince William Sound and the Alaska Peninsula also conduct bait fisheries. The decrease in duration of crab fisheries further reduces the demand for herring. Observations by department staff on the grounds and anecdotal accounts of herring estimates by fishermen indicate that large volumes of herring were present at herring bait fishing areas and that decreased vulnerability, due to seine depth restrictions imposed on the bait fishermen in the mid 80's, and poor marketability due to size reduced the catches below quota.